

MONTHLY WEATHER REVIEW,

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WAR DEPARTMENT,

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DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE

INTRODUCTORY.

The present summary of the weather for March is compiled from the regular tri-daily observations of the United States Signal Service stations, the regular Canadian observations and a large mass of the Volunteer Observers' reports, together with manuscript, marine and other occasional communications. The observable characteristics of the meteorology of March are the following: First, the disastrous tornadoes which, on the 20th, visited the States of Alabama and Georgia, and thence passed off towards the Carolinas; second, the general liquidation of the winter's accumulation of ice and snow in the valleys of those rivers which drain the eastern and western slopes of the Alleghany and Blue Ridge mountain-chains; third, the unusually heavy ice-drifts and icebergs which were reported off the coasts of North America; fourth, the very heavy rain-fall in the cotton-producing regions of the Southern States; fifth, the unusually low temperature and late spring.

ATMOSPHERIC PRESSURE.

Chart No. II, by its isobarometric lines, graphically exhibits the average pressure of the atmosphere in the various districts during March. From these lines of equal pressure, it is seen, that the area or belt of highest pressure for March stretches along the Atlantic coast from Florida towards Cape Cod.

(1) *Areas of high barometer.*—The surface-currents of cold air from the frigid regions of British America, so conspicuous in February, were evidently checked as the month of March advanced, and the areas of high barometer grew less and less marked. During March, there were no such very high barometers as were reported (viz., 30.92 inches, 30.96 inches, and 30.98 inches, on February 6th) in the preceding month. The principal areas of high barometer may be thus enumerated:

No. 1, emerging from the Northwest on the 2d of March, and slowly advancing southeastwardly through the upper Mississippi valley, and thence extending eastward on the 3d, over the Lakes and New England, but apparently divided by low barometer No. II, which approached the Lakes from the Gulf region. This high barometer was evidently due to a very broad but shallow surface-current of cold air, flowing from British America southward over the Northwest, the Lakes and New England, being partly obstructed, as most of the areas of high barometer are, by the "Height of Land" or elevated wall, running north of the St. Lawrence river and the Lakes. After the passage of low barometer No. II, to the east, the pressure from high barometer No. 1 was soon propagated from the Lakes to the Gulf States.

No. 2, although not marked by very high pressure, had, on the afternoon of the 8th, extended itself almost entirely over the whole country east of the Mississippi valley, and, at midnight of the same day, was central over the Alleghany belt.

No. 3 was a minor area of high pressure, which moved across the Gulf States on the 9th and 10th, and on the 11th disappeared off the South Atlantic coast.

No. 4. During the 15th of March the pressure increased, generally, in a long line from north to south, west of the Mississippi river. On the 16th, this area of high barometer remained west of the Mississippi from Dakota to Louisiana. On the 17th, it advanced slowly eastward, the southern portion of the high pressure belt becoming detached in the Gulf States; and moving southeastwardly, while storm-centre No. VIII, coming up from the far Southwest, intervened between it and the main or northwestern portion of the high pressure area. On the night of March 18th, the barometer in the Northwest rose as high as 30.61 inches; meantime the southern storm-centre (No. VIII) was in Louisiana. This storm-centre came in, therefore, between two areas of high pressure, and this fact is of great interest in studying and elucidating the tornadoes which followed in the train of storm-centre No. VIII, and, on the 20th instant, inflicted so much damage and disaster in Alabama, Tennessee and Georgia.

No. 5. The next noticeable high pressure area appears on the Weather Map for March 22, 7:35, A. M., when the barometric readings for the whole interior of the country, (from the Lakes, Wisconsin and Iowa to the Gulf coast,) are high. This area is seen during the day of the 22d, in a more concentrated form, central in the Ohio valley and moving eastward. On the 23d, this area passed slowly over the Alleghanies and the Middle States, gradually disappearing in the Atlantic on the 24th.

No. 6. Still another area of high pressure commenced advancing from the northwest on the night of the 23d, and progressed eastward, becoming central in the lower Ohio valley at midnight of the 24th. Thence, on the 25th, it crossed Tennessee and North Carolina, and left the Carolina coast on the 26th.

No. 7. One more important area of high barometer passed, on the 27th, over the Northwest and Upper Lake region; and on the 28th, at 7.35, A. M., was central just north of Lake Ontario, whence, during that day and the following, it made its way to New England and the Middle States, where it remained nearly stationary, with northeasterly and southeasterly winds and partly cloudy weather, till after the month closed. The meteorological effects of this area will come into further notice in the study of the April weather.

(2.)—The following were the only depressions worthy of notice in the Review:

No. I. The first storm-centre of the month passed rapidly, during the morning of March 1st, from eastern Missouri to the middle of the Ohio valley; thence, during the afternoon and evening, to Pittsburgh; and between midnight of the 1st and the morning of the 2d, it moved off the New England coast. This storm-centre was attended with heavy rains in the Southern and Gulf States and Tennessee, with high winds, sleet and snow on the middle and eastern Atlantic coasts, and with heavy snows in the Lake region and the upper Mississippi valley, and heavy rains in the Ohio valley. The Ohio and its tributaries rose considerably after the passage of the disturbance.

No. II was slightly developed in the western Gulf on the morning of the 2d, but its cyclonic influence was not marked till the afternoon of that day, when high, northerly

winds and cold weather were reported from the western Gulf, and warm southerly and easterly winds and rain from the eastern Gulf and south Atlantic States. This depression moved northward rapidly, crossing the Ohio river about midday of the 3d, a little east of Cincinnati, and thence, curving north of Pittsburgh, its course lay somewhat south of east, and, during the night of the 3d, it disappeared off the New Jersey coast. Very high winds accompanied it on the Atlantic coast, the anemometer showing gales of forty miles an hour at Sandy Hook and Long Branch, and fifty miles an hour at Squan Beach. Heavy rains fell along its pathway from Mississippi to Kentucky, and snow and sleet prevailed north of the Ohio valley and over the Middle and Eastern States.

No. III. The next definite depression comes into view on the midnight of the 4th, preceded by a light snow in the lower Missouri valley. Though not an obscure depression, this disturbance was less marked than its two predecessors; it moved more slowly forward, and its rains and winds were more moderate.

No. IV. On the morning of the 6th a storm-centre of more decided features appeared on the Gulf coast south of Louisiana, preceded by rain and easterly winds in Mississippi and Alabama. The path of this storm lay almost due northeast, through Alabama, East Tennessee and Virginia, and thence off the Atlantic coast towards Halifax, which it reached on the evening of the 8th, having kept up nearly a uniform progressive velocity. The rain-fall along its route was very great, as will be seen by some of the reports; At Knoxville, .86 inch of rain fell in 24 hours; at New Orleans, 1.20 inches in 24 hours; at Montgomery, Alabama, 2.02 inches in 24 hours; at Norfolk, 2.78 inches in 24 hours; at St. Marks, Florida, 2.84 inches in 24 hours. In the Mississippi valley, snow fell at and south of Memphis, and a severe "norther" (in which the wind blew 60 miles an hour) prevailed on the afternoon and evening of the 6th, off the Texas coast. As the gale approached the Atlantic coast, very high winds and heavy seas were experienced, with occasional gales blowing from 40 to 50 miles an hour, and heavy rains and snows in the Middle and Eastern States, extending west to the central Ohio valley.

No. V. On the 8th, another depression, accompanied by snow, began to move from the Northwest across the Lake region; though in its Lake-track considerable snow fell, it was not otherwise worthy of notice.

No. VI is first seen on the Weather Maps on the afternoon of the 10th, during which it developed into a trough-shaped depression, running north and south from Dakota toward Kansas. During the morning of the 11th, it was passing in a more concentrated form, across Iowa; and, on the evening of that day, appeared on the eastern side of Lake Michigan, whence its track lay nearly due northeastward, and it disappeared during the afternoon of the 12th, north of the St. Lawrence valley. There is nothing else special to note concerning it.

No. VII pursued an eccentric course, and with a progressive velocity frequently varying. It entered the field of observation in Dakota on the 12th, and moved southeast to Eastern Kansas, where its centre was nearly stationary, in the vicinity of Leavenworth, for twenty-four hours. Its path thence runs northeastwardly to Toledo and Detroit, from which points it passed in a northerly direction over Lake Huron, and thence nearly due eastward over Canada, not leaving the Atlantic coast till the evening of the 18th. So slow was its motion, and yet low the barometer, that this depression drew toward it large masses of warm, moist air from the Gulf and South Atlantic regions. Drawn

toward the interior and Appalachian Mountains in the shape of vapor-laden southerly winds, these warm volumes of air served to liquify the mountain-ices and snow—the accumulation of the winter—and, dislodging immense quantities of ice along the already rain-swollen rivers that drain the Appalachian slopes, very dangerous ice-gorges and floods were produced in these streams. This result was, of course, intensified by the warm and copious rains that fell over nearly the whole country from the Gulf to the Lakes and New England, during the deliberate passage of this storm-centre. This depression was followed by heavy snow-storms in the Lake region and the Northwest.

No. VIII. This storm was the most important in its consequences and far-reaching disturbances, that occurred during March. It formed and manifested itself slowly in the Western Gulf region during the 17th and 18th, and moved slowly through Louisiana on the 19th. Its centre advanced rapidly northeastward from the vicinity of Vicksburg on the evening of the 19th, reaching the interior of Kentucky on the morning of the 20th, and thence progressing in a more easterly direction, reached Eastern Virginia in the afternoon of the same day. From this district it appears to have progressed in a southeasterly course toward Cape Hatteras, and to have started on its Atlantic track upon or about the 33rd parallel of north latitude. Very heavy rains fell in the Gulf and South Atlantic States on the 19th and 20th. The storm, as it neared the Atlantic coast, produced, by its indraught, high and dangerous easterly winds. But its most serious consequences were felt in Alabama, Georgia and South Carolina, in the shape of a series of fearful **TORNADOES**.

These **TORNADOES**, perhaps four in number, occurred with most disastrous results over the country between central Alabama and central South Carolina, about noon and in the afternoon of March 20th. One of these storms entered Harris county, Georgia, from Lee county, Alabama, about noon. A wind-storm was reported at Atlanta, early in the day, and followed by hail at 1 P. M. One of these tempests appears to have divided near Hancock county, Georgia, one part going east on a track more northerly than that of the other.

But the effects of this remarkable storm are apparently traceable beyond the United States, and as far east on the ocean as the Bermuda Islands. On the 21st of March, the observer reports a gale from the Southwest set in at St. George's, the wind in the afternoon rising to 61 miles an hour, with a falling barometer. On the 22d of March, the barometer still falling slowly, the wind was still very high, and, at 5 P. M., a thunder-storm passed to the southward. On the 23d, at 12.30 A. M., the wind shifted to northwest suddenly, and at 1.30 A. M., the velocity was 81 miles an hour, with squally weather and rain. There is, therefore, reason to suppose that the general depression which passed off the Carolina coast on the 20th, was felt at the Bermudas on the 21st, 22d and 23d.

No. IX. On March 22d, the afternoon reports showed a depression in Dakota, moving slowly southeastward. Its track is given on the Storm-Chart, but it does not appear to have been of any special importance.

No. X passed from Dakota north of the Lakes, and thence eastward through the St. Lawrence valley, with no very noteworthy phenomena.

No. XI. On the 28th, the barometer was low west of the Mississippi river, and, on the night of the 29th, there was a noticeable depression, central in Nebraska, which, on

the 30th, passed slowly over the Upper Lake region, remaining nearly stationary during the afternoon and night of the 30th, and rapidly moving to the northeastward early on the morning of the 31st.

ATMOSPHERIC TEMPERATURE.

Chart No. II expresses graphically (by the red isothermal lines) the mean distribution of temperature for March; and the table in the left-hand lower corner gives, numerically, the actual and comparative severity and mildness of the temperature for the various districts. The isotherms of 20° (running through the Lake region and the St. Lawrence valley) and 60° (running through the Gulf States) indicate the extreme thermometric means for March. The means for the St. Lawrence valley, the Middle States, the whole Lake region and Upper Mississippi valley, are all 5° or more below those of many years, evidencing the extraordinary severity and protractedness of the winter's cold. In only one district east of the Rocky Mountains (i. e. the South Atlantic States) has the temperature been as high as usual for the month. The lateness of the spring is specially marked in the lower Missouri valley, and is also observed in New England and the Northwest. The abnormal cold of this month is the lingering result of the intensely severe winter, and is not ascribable to any physical causes operating in March. The isothermal lines run nearly due east and west, with no southward deflection in the Mississippi valley, due to areas of high barometer and low temperature descending from the Northwest. A comparison of the isothermal lines for February and March shows that, during the latter month, the mean rise of temperature over the United States was from 5° to 10° Fahrenheit.

PRECIPITATION.

On Chart No. III is shown the distribution of rain and melted snow for March. It will be seen from this that a very large excess of rain fell in the lower Mississippi valley, the Gulf and South Atlantic States and Tennessee. In these districts the fall amounted, in some localities, to 12 or 14 inches and more. There was also a very unusual quantity of water precipitated in southern and central Virginia. The minimum fall occurs in the Florida peninsula; but in the other portions of the South Atlantic States a very great excess fell, the total amount in Georgia occasionally exceeding 10 inches. The largest excess is in Tennessee, where the month's rainfall has been more than double the usual quantity. The only deficiency, and that an insignificant one, is in the Lower Lake region. This immense and general rainfall is attributable to the large evaporation of ice and snow and the moist southerly winds encountering, in their movements, the condensing influence of a continent chilled to an unusual degree by the excessive cold of January and February.

The number of days on which rain fell during the month, in the several districts, averages as follows: In New England, 15 days; in the Middle Atlantic States, 15; in the South Atlantic States, 14; the Gulf States, 12; the Lake region, 15; the Ohio valley and Tennessee, 15, and in the Northwest, 11 days.

HUMIDITY.

The average relative humidity for the various districts is as follows: For New England, 73 per cent.; Middle Atlantic States, 76; South Atlantic States, 72; the Eastern Gulf States, 74; Western Gulf States, 71; Lower Lakes, 75; Upper Lakes, 73; Ohio valley and Tennessee, 67; Upper Mississippi valley, 74; the Lower Missouri valley, 72; and Minnesota, 77.